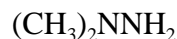


1,1-DIMETHYL HYDRAZINE

1,1-Dimethyl hydrazine is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 57-14-7



Molecular Formula: $\text{C}_2\text{H}_8\text{N}_2$

1,1-Dimethyl hydrazine is a clear, colorless, flammable, hygroscopic liquid with an ammonia-like, fishy odor. It is miscible with water, ethanol, ether, dimethylformamide, and hydrocarbons. The liquid fumes in air and gradually turns yellow. Its vapor is inflammable in air but ignites spontaneously when in contact with heat, flame, or oxidizers. When heated to decomposition, it emits toxic fumes of nitrogen oxides (NTP, 1991).

Physical Properties of 1,1-Dimethyl Hydrazine

Synonyms: unsym-dimethylhydrazine; asym-dimethylhydrazine; n,n-dimethylhydrazine; UDMH; Dimazine

Molecular Weight:	60.10
Boiling Point:	63.9 °C
Melting Point:	-58 °C
Flash Point:	-15 °C (5 °F)
Vapor Density:	1.94 (air = 1)
Density/Specific Gravity:	0.791 at 25/4 °C (water = 1)
Vapor Pressure:	157 mm Hg at 25 °C
Conversion Factor:	1 ppm = 2.46 mg/m ³

(HSDB, 1991; Merck, 1989; Sax, 1987; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

1,1-Dimethyl hydrazine is used as a component of jet and rocket fuels, in chemical synthesis, as a stabilizer for organic fuel additives, as an absorbent for acid gases, and in photography (HSDB, 1991).

The primary stationary sources that have reported emissions of 1,1-dimethyl hydrazine in

California are manufacturers of guided missiles and space vehicles and parts (ARB, 1997b).

B. Emissions

The total emissions of 1,1-dimethyl hydrazine from stationary sources in California are estimated to be at least 910 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

1,1-Dimethyl hydrazine has not been reported as occurring naturally (HSDB, 1991).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of 1,1-dimethyl hydrazine.

INDOOR SOURCES AND CONCENTRATIONS

No information regarding the indoor sources and concentrations of 1,1-dimethyl hydrazine was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

In the atmosphere, 1,1-dimethyl hydrazine will react with hydroxyl (OH) radicals and ozone (O₃). The gas phase reaction with the OH radical is expected to have a calculated half-life and lifetime of about 4 hours and 5 hours, respectively. The reaction with O₃ is fast, leading to a calculated half-life and lifetime of 1,1-dimethyl hydrazine due to reaction with O₃ of less than 17 minutes and 25 minutes, respectively, for an average O₃ concentration of 30 ppb. Clearly, the ozone reaction is calculated to dominate, leading to a short half-life and lifetime for 1,1-dimethyl hydrazine in the atmosphere (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of April 1996, 1,1-dimethyl hydrazine contributed to the total cancer risk in 1 of the approximately 550 risk assessments reporting a total cancer risk equal to or greater than 1 in 1 million (OEHHA, 1996a).

HEALTH EFFECTS

The most probable routes of human exposure to 1,1-dimethyl hydrazine are inhalation, ingestion, and dermal contact.

Non-Cancer: 1,1-Dimethyl hydrazine is a central nervous system convulsant, and an irritant of the eyes, skin, and respiratory tract. It is toxic to the liver. Symptoms of acute inhalation overexposure in humans include headache, facial numbness and swelling, increased salivation, nausea, vomiting, seizures, coma, and pulmonary edema. Chronic exposure in test animals has been shown to cause hemolytic anemia, convulsive seizures, and kidney damage (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) Reference Concentration (RfC) is under review, and no oral Reference Dose (RfD) has been established (U.S. EPA, 1994a).

No information on adverse reproductive effects in humans or animals is available (U.S. EPA, 1994a).

Cancer: No information on the carcinogenic effects of 1,1-dimethyl hydrazine in humans is available. Limited evidence in rats and mice exposed by inhalation indicates increased tumors of the skin, lung, kidney, liver, pancreas, and pituitary, and a high incidence of angiosarcomas in various organs in mice. The U.S. EPA has classified 1,1-dimethyl hydrazine in Group B2: Probable human carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer (IARC) has classified 1,1-dimethyl hydrazine in Group 2B: Possible human carcinogen based on sufficient evidence in animals (IARC, 1987a).

The State of California has determined under Proposition 65 that 1,1-dimethyl hydrazine is a carcinogen (CCR, 1996). The preliminary recommended potency value for use in cancer risk assessments is 4.9×10^{-4} (microgram per cubic meter)⁻¹. In other words, the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of 1,1-dimethyl hydrazine is estimated to be no greater than 490 in 1 million (CAPCOA, 1993).

